



**Energy Efficiency and Renewable Energy
Federal Energy Management Program**

How to Buy an Energy-Efficient Electric Water Heater

Why Agencies Should Buy Efficient Products

- Executive Order 13123 and FAR section 23.704 direct agencies to purchase products in the upper 25% of energy efficiency, including all models that qualify for the EPA/DOE ENERGY STAR[®] product labeling program.
- Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.
- As the world's largest consumer, the federal government can help "pull" the entire U.S. market towards greater energy efficiency, while saving taxpayer dollars.

For More Information:

- DOE's Federal Energy Management Program (FEMP) Help Desk and World Wide Web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.
Phone: (800) 363-3732
www.eere.energy.gov/femp/procurement
- American Council for an Energy-Efficient Economy (ACEEE) publishes the *Consumer Guide to Home Energy Savings*.
Phone: (202) 429-0063
www.aceee.org
- *Home Energy* magazine provides energy conservation tips on water heating.
Phone: (510) 524-5405
www.homeenergy.org
- The Gas Appliance Manufacturers Association (GAMA) publishes the *Consumer's Directory of Certified Efficiency Ratings for Heating and Water Heating Equipment*. This directory is available at:
www.gamanet.org
- Lawrence Berkeley National Laboratory provided supporting analysis for this recommendation.
Phone: (202) 646-7950

Efficiency Recommendation

Storage Type (Rated Volume)	Recommended		Best Available	
	Energy Factor ^a	Annual Energy Use ^b (kWh/year)	Energy Factor	Annual Energy Use (kWh/year)
Less than 60 gallons	0.93	4,721	0.95	4,622
60 gallons or more	0.91	4,825	0.92	4,773

a) Energy Factor is an efficiency ratio of the energy supplied in heated water divided by the energy input to the water heater.

b) Based on DOE test procedure, see 10 CFR 430, Sub-Part B, Appendix E.

The federal supply sources for electric water heaters are the General Services Administration (GSA) and the Defense Logistics Agency (DLA). GSA sells water heaters through its Multiple Awards Schedule program and online shopping network, *GSA Advantage!* DLA sells them through the Defense Supply Center Philadelphia and online through *DoD EMall*. Whether purchasing water heaters from GSA, DLA or a commercial source check the yellow EnergyGuide label to find models that meet the recommended Annual Energy Use (kWh/year). In solicitations and contracts, specify an Energy Factor (EF) that meets this efficiency recommendation.

Where to Find Energy-Efficient Electric Water Heaters

Storage-type water heaters are the most commonly used products but also have significant standby losses. Where hot water use is low (i.e., rest rooms in office buildings) installing a demand-type (instantaneous) electric water heater can result in substantial savings. These products heat water as it is used and, due to their compact size, are typically located near the point of use. Absence of a storage tank and shorter distribution lines greatly reduces standby losses and increases efficiency.

Water Heating Options

Where natural gas is available on-site, a gas water heater will almost always be more cost-effective than an electric model. Depending on the climate and energy costs, a solar-assisted or heat pump water heater may result in substantial energy and cost savings.

Water heaters must be sized properly. Over-sized water heaters not only cost more but increase energy use due to excessive cycling and higher standby losses. ACEEE's *Consumer Guide* and GAMA *Consumer Directory* (see "For More Information") provide guidance on proper sizing. A water heater should be selected based on first-hour rating (FHR), not tank size. When installing storage-type water heaters, select the smallest models that meet the FHR and this recommendation.

Energy costs increase with water temperature. Dishwashers require the hottest water of all household uses, typically 135° to 140°F. However, these devices are usually equipped with booster heaters to increase the incoming water temperature by 15° to 20°F. Setting the water heater between 120 and 125°F and turning the dishwasher's booster on should provide sufficiently hot water while reducing the chances for scalding. Turning electric water heaters down or off during unoccupied periods will save significantly on energy costs, as will water heater timers or load controls in buildings with time-of-use rates or demand charges.

Sizing

User Tips

Electric Water Heater Cost-Effectiveness Example (50 gallon tank with 58 to 62 gallon First Hour Rating)

Performance	Base Model	Recommended Level	Best Available
Energy Factor	0.90	0.93	0.95
Annual Energy Use	4,879	4,721	4,622
Annual Energy Cost	\$293	\$283	\$277
Lifetime Energy Cost	\$2,962	\$2,862	\$2,795
Lifetime Energy Cost Savings	-	\$100	\$167

Definition

Lifetime Energy Cost is the sum of the discounted value of annual energy costs based on average usage and an assumed water heater life of 13 years. Future electricity price trends and a discount rate of 3.0% are based on federal guidelines (effective from April, 2004 to March, 2005).

Cost-Effectiveness Assumptions

The Base Model is a 50 gallon storage-type water heater with an EF of 0.90, which just meets current US appliance standards, and a FHR of 62 gallons. The Recommended model is a 50 gallon storage-type with an EF of 0.93 and a FHR of 60 gallons. The Best Available is a 50 gallon storage-type with an EF of 0.95 and a FHR of 58 gallons. Annual energy use in this example is based on the standard DOE test procedure and calculated assuming an inlet water temperature of 58°F, setpoint of 135°F, daily hot water demand of 64 gallons, and 365 days per year of use. The assumed electricity price is 6¢/kWh, the federal average electricity price (including demand charges) in the U.S.

Using the Cost-Effectiveness Table

In the example above, the recommended water heater is cost-effective if its purchase price is no more than \$100 above the Base Model. The Best Available model is cost-effective if its purchase price is no more than \$167 above the Base Model.

What if my Electricity Price is different?

To calculate Lifetime Energy Cost Savings for a different electricity price, multiply the savings by this ratio: $\left(\frac{\text{Your price in } \$/kWh}{6.0 \text{ } \$/kWh}\right)$.

Metric Conversions

1000 Btu/h = 293 watts
1 gallon = 3.8 liters
°F = (1.8 * °C) + 32

